ANALYSIS OF THE DYCHE VALLEY INFESTATION

CLEVELAND NATIONAL FOREST

by

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Ranger A.M. Longacre of the Palomar Ranger District, Cleveland National Forest, reported a heavy pine bark beetle infestation in the Dyche Valley area in his report of October 2, 1930. He stated that the infestation may have been caused by the weakened condition of the trees, due to injury inflicted on the stand by the Beauty Mountain Fire of September 18-30, 1928, which burned into the area concerned.

Examination showed that a large portion of the infestation was undoubtedly due to the effects of the fire, and that the spread of infestation outside the burned area and the recent increase in the number of trees attacked could also apparently be attributed to the fire. The infestation did not afford an opportunity to make a detailed study of the situation, so that no definite conclusions may be drawn from it. It is felt, however, that the spread of the infestation and its increase in intensity outside the area are at variance with the general statements regarding the course of bark beetle infestations following fires published by Miller and Patterson[1], and thus should be noted for future reference. As will be brought out in this memorandum, other factors may have contributed to the infestation.

Area

According to the report of Ranger Longacre, approximately 1280 acres are involved in the infestation, 20% of which is owned by the Government and 80% by private owners.

The rough map accompanying this memorandum gives the salient features concerning the land ownership, extent of timber type affected, and approximate extent of the fire, which burned from the north into the timbered area. In addition, the location of the insect-killed trees examined and the approximate location of the strip cruised are indicated by the location of the groups of trees on the map.

Topography

In general, the exposure is northeast. A ridge extends along the western and southern boundaries (roughly) of the timber type, and from this there is a general slope down to the creek running through the area. In Sec. 21, Group 7 is on another elevation, and the untimbered area between that and the creek has a northwestern or western exposure. The altitude range is from about 3800 to 4600 feet.

Stand

The entire pine stand is Coulter pine of uneven age classes, although the younger classes predominate. Some western yellow pine is to be found in the area, but in no place does it appear to predominate. Other species seen were big-cone spruce and incense cedar.

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[1] Miller, J.M., and Patterson, J.E. Preliminary Studies on the Relation of Fire Injury to Bark Beetle Attack in Western Yellow Pine. Jour.Agr.Res. 34:612, 1927

Examination of cores indicates a fast growth for the past twenty years and a definite narrowing in the width of rings in the 1918 and 1919 seasons; a more irregular slowing-down of growth in 1924 and 1925: and in general another period of slower growth from 1928 to the present time. The 1930 ring is uniformly much narrower than normal. No appreciable difference is to be noted between the cores of living and insect-killed trees of the same tree classes. Class II and Class III, fire-injured trees, show the effects of their injury in their growth record.

Fire Injury

The fire swept through the timber in Section 17 and the northwest quarter of Section 20. Apparently the greater portion of the injury caused by the fire resulted in Class II or lightly-injured trees, in which only a small portion of the foliage was damaged. At the tops of the small ridges separating small watercourses tributary to the main drainage of the area, the fire appeared to have been of greater intensity; and Class III fire-injured trees, or those in which the greater portion of the foliage was scorched, occur. In some spots the dead trees killed previous to 1929 winter apparently are to be placed in Class IV fire injury. The only Class V trees seen on the cruise strip, or those entirely killed by the fire, were small reproduction and pole-size trees.

Of the infested trees examined on the strip within the fire line, 22 or 24.2% were old kill and were not classified; 54 or 59.3% were uninjured (Class I); 7 or 7.7% were slightly injured (Class II) and 8 or 8.8% were heavily injured (Class III).

Infestation

Broods Concerned. The Beauty Mountain fire occurred from September 18 to September 30, 1929. Because of this, if the usual concentration of beetles occurred within the fire area there might have been some concentration of the late 1928 winter brood, but the first concerted attack would be that of the 1929 summer brood. This would be followed by the 1929 winter and the 1930 broods. Thus there are, practically speaking, four distinct broods to be dealt with at the present time, as the infestation before the time of the fire was evidently light. Data have been secured on three of these broods, and the number of trees killed before that time are recorded, but with less detail. For all practical purposes these may be considered the 1929 summer brood.

Insect Species Concerned. All the injury, so far as could be determined by examinations of the bases of the trees, has been caused by the western pine beetle, Dendroctonus brevicomis Lec.

Fire Injury and Infestation. The infestation within the fire area and the area north of the road in Section 20 is so heavy that insect-killed trees apparently predominate. There is a gradual lessening in intensity of the infestation in the area near the road, however, and portions show a much lighter loss. South of the road the infestation is not so heavy, and consists of isolated large and small groups of relatively recent attack.

This condition gives the impression that the center of the original infestation lies within or near the fire line and that it has since spread outward. With this in mind, three groups of insect-killed trees (7, 17 and 28) at various distances from the fire were studied. In addition a strip cruise was made, five chains in width, starting at the road and extending northward 60 chains through the fire area to the edge of the timber (Groups 10,4,1,27,15,32 and 4). It was felt that, if results showed the older kill to be centered in the fire area and the outer infestation groups to be entirely new, there would be some basis for ascribing the entire infestation outside and inside the fire area to injuries caused by the fire and subsequent spread after a concentration of beetles in that area.

According the trees examined are considered to be in five groups, separating them on the basis of isolation from the fire area as follows:

7- - - - - - - Isolation by type and distance
17- - - - - - - " distance
28 - - - - - - Intermediate
10,4,1- - - - -Outside but adjoining fire area
27,12,15,32,4- Within fire area

The following table gives information of interest concerning these groups:

Group	Total Trees	No Trees under 12" DBH: 29W	29W	30S	30W	No Trees over 12" DBH: 29W	30S	30W	Species: C.P.	Y.P.	Volume[3] 1929 W: Total	1930 S: Total	1930 W: Total	Total
7	7	0	0	0	1	0	1	5[1]	7	0	0	2,580	490	3,070
17	17	0	0	0	1[1]	2	3	11[1]	16	1	180	1,510	5,030	6,720
28	28	0	1	1	1	0	14	11[2]	28	0	0	3,950	4,870	8,820
10, 4, 1	18	2	0	1	3	2	6	4[1]	18	0	3,660	2,360	3,120	9,140
27,12,15 32, 4	91	22	1	0	12	28	4	24	91	0	14,240	2,610	14,440	31,290
											18,080	13,010	27,950	

1 - 1 top-killed
2 - 2 "
3 - Trees under 12" DBH not included

Classes of Fire Injury				
I	II	III	IV	V
54	7	8	0	0

It must be mentioned here that a large number of trees examined in the group adjoining and within the fire area were mixed-brood trees--i.e., brood of several seasons attacked the same tree. Thus many trees classified as 1929-W still contained broods that had filled in in previously unattacked portions. A few larvae were found in winter-killed trees and even in portions of trees that by no stretch of the imagination could be considered as anything but 1929 winter-brood trees, although the insects found were 1930 winter brood. Thus the allocation of these trees to a definite brood year must be considered arbitrary, and is dependent on the personal estimate of each situation.

Analysis of the brood data on the basis of percentage of the number of trees killed by the different broods in the area cruised gives the following results, which are illustrated in Fig. 1:

Figures in Per Cent of Total Cruised

Group	Ante 1929W	1929W	1930S	1930W
7	0	0	14.3	85.7
17	0	11.8	17.6	70.6
28	0	3.6	53.6	42.8
10, 4, 1	11.1	11.1	38.9	38.9
27,12,15,32,4	24.2	31.9	4.4	39.5

If no other causes for the infestation are apparent it might be safe to conclude, on the basis of the brood data given above, that the infestation probably originated within the fire area and spread to outside areas, contrary to our general theories regarding the action of infestations following fires. However, other factors may be concerned, as follows:

Precipitation

Although rainfall deficiency has been considered by several writers[2] the cause of bark beetle epidemics, there is no published paper known to the writer correlating outbreaks of the western pine beetle with insufficient rainfall. It is generally conceded, however, by those working on the problem that the effect of rainfall on the western pine beetle, working indirectly through the host tree, is noticeable. If this is the case, deficient rainfall may be a factor in the present infestation in Dyche Valley. At Warner Springs, the nearest station from which data could be secured, the following annual precipitation has been recorded for the past three years:

Year	Inches	Deviation from Normal
1928	8.42	-9.78
1929	11.97	-6.23
1930	19.66	+1.46
1931(to Feb.28)	5.97	-1.77

It may be seen from the above that the area has received less than normal rainfall during the course of the present epidemic and that possibly this condition, in conjunction with the abnormal concentration and attack of the beetle population within the fire area, has made possible an attack and increase in intensity of the infestation outside the area. This, although drawing on the population within the fire area, may otherwise have been relatively independent of the infestation brought on by fire injury.

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[2] Blackman, M.W. The Effect of Deficiency and Excess of Rainfall Upon the Hickory Bark Beetle. Jour.Econ.Ent. 17:460-470; 1924.
Craighead, F.C. Bark Beetle Epidemics and Rainfall Deficiency. Jour. Econ.Ent. 18, 577-586, 1925
Felt, E.P. Notes on Forest Insects. Jour.Econ.Ent.7,373-375; 1914.
Hopkins, A.D. Bark Beetles of the Genus Dendroctonus. Bul.83,Pt.I,Bur. Ent.,USDA, 1909.
Uvarov, B.P. Weather and Climate in Their Relation to Insects. Conf.of Empire Meteorologists,Agr.Sec.II,130-147. 1929.

Tree Species

An element in the problem that remains unknown is the effect of the host species concerned in the infestation. Nothing is known in regard to the relationships existing between the western pine beetle and Coulter pine. It is unnecessary to point out that they may be quite different from those existing between western yellow pine and the pine beetle; for variations in range, choice of sites, height etc. are known to exist, and differences in susceptibility to insect attack may also occur.

SUMMARY

The Dyche Valley infestation appears to have some connection with the Beauty Mountain fire of 1928. Although the spread of the infestation outside the fire area is unusual, an analysis of the broods concerned in the infestation shows the more recent brood trees to occur in greater numbers and proportions of the total loss as the distance from the fire area increases. This would seem to favor the conclusion that the infestation has spread from the fire area.

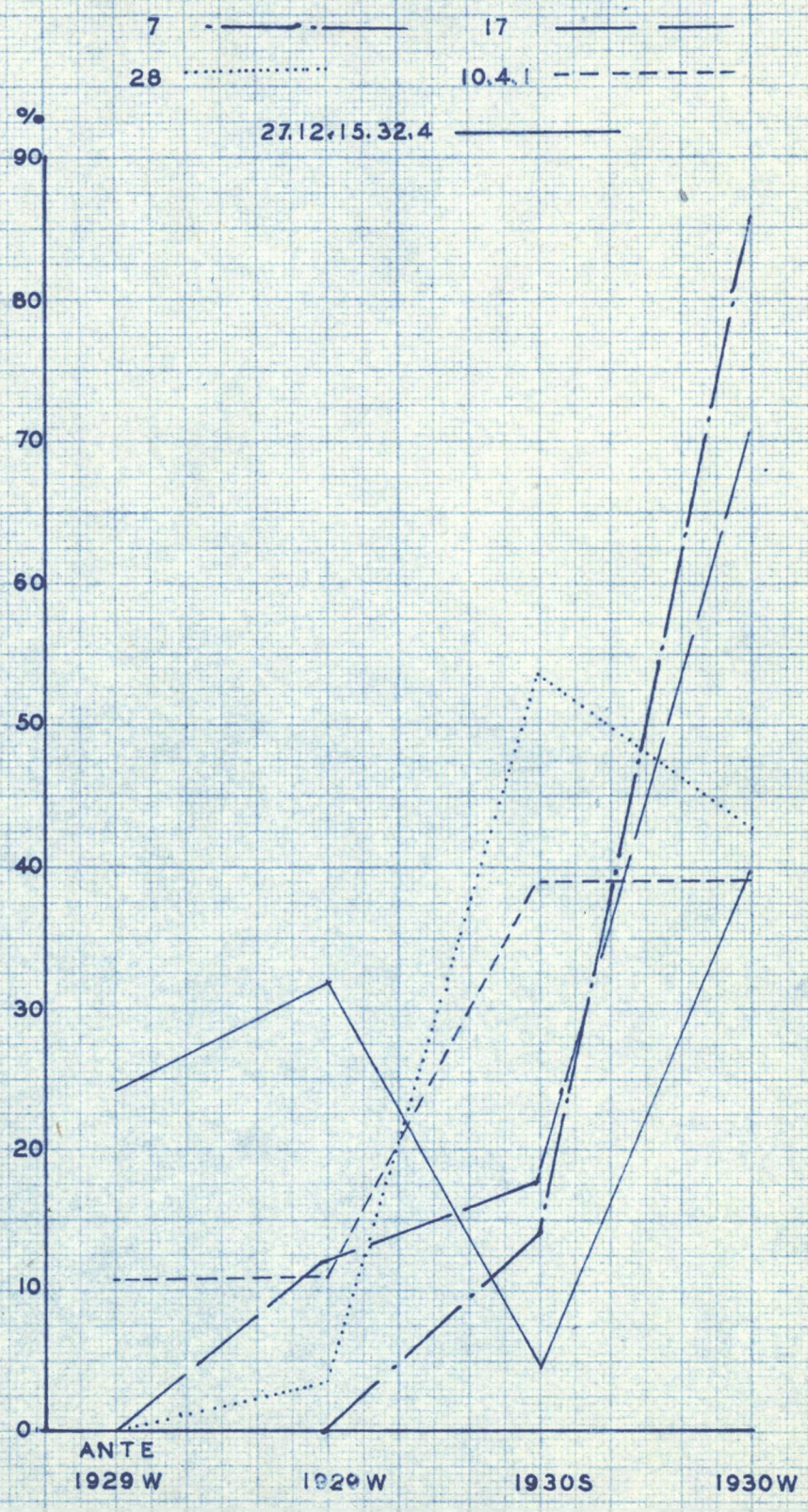
The fact that there has been a marked deficiency in rainfall during the run of the infestation is pointed out as a factor that might be concerned in the spread and increase in intensity of the infestation outside the fire area.

It is also pointed out that nothing is known regarding infestations in Coulter pine, and that the host tree may introduce factors unknown to us at the present time.

PALOMAR MOUNTAIN INFESTATION

KILL BY BROODS - GIVEN IN PERCENT OF TOTAL

GROUPS



PALOMAR MOUNTAIN INFESTATION

T 10 S. R 2 E. S B M

FEBRUARY, 1931 SCALE 2 IN. = 1 MI.

LEGEND

APPROX. TYPE BOUNDARY - - - - APPROX. FIRE LINE ——.——

INFESTATION GROUPS